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TRANSMITTAL OF APPEAL BRIEF			Docket No. M-9998-1P US
In re Application of: Brian S. Medower et al.			
Application No. 09/854,333	Filing Date May 11, 2001	Examiner Martin J. Angerbranndt	Group Art Unit 1756
Invention: Optical Data Storage Media with Enhanced Contrast			

TO THE COMMISSIONER OF PATENTS:

Transmitted herewith is the Appeal Brief in this application, with respect to the Notice of Appeal filed: April 9, 2007.

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Dated: September 10, 2007

Jonathan W. Hallman
Attorney Reg. No.: 42,622
MacPherson Kwok Chen & Heid LLP
2033 Gateway Place, Ste. 400
San Jose, CA 95110
(949) 752-7040 Facsimile: (408) 392-9262

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Appeal brief 18 pages plus this transmittal

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M-9998-1P US - APPEAL BRIEF TRANS

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First named Inventor: Brian S. Medower

Application No. 09/854,333

Filing Date: May 11, 2001

For: Optical Data Storage Media with Enhanced Contrast

Examiner: Martin J. Angebranndt

Art Unit: 1756

Attorney Docket No.: M-9998-1P US

APPEAL BRIEF

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Real Party in Interest

The real party in interest is DPHI Acquisitions, Inc., the present assignee of US Application No. 09/854,333.

Related Appeals and Interferences

There are no other appeals, judicial proceedings or interferences known to the appellant which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

Status of Claims

Claims 1-20 are twice rejected by the Final Office Action dated November 8, 2006.

The rejection of claims 1-20 is appealed.

Status of Amendments

No amendments have been submitted since the Final Office Action dated November 8, 2006.

Summary of Claimed Subject Matter

Conventional optical storage media generally take the form of a data-carrying layer formed on a disk shaped polycarbonate substrate. To allow the consumer to handle conventional disks such as the familiar DVDs and audio CDs, the data-carrying layer is then covered with an additional polycarbonate layer. A conventional optical storage disk thus effectively has two polycarbonate substrates: a first substrate over which the data-carrying layer is formed and a second substrate that overlays the data-carrying layer. The thickness of the second polycarbonate substrate is such that, with regard to the interrogating laser beam used to read/write the disk, imperfections such as fingerprints and dust on the surface of the second polycarbonate substrate are defocused with regard to the underlying data-carrying layer. Applicants denote such disks as "substrate-incident" media. (see, e.g., page 1, lines 7-12). However, this defocusing effect for substrate-incident media also introduces substantial optical aberrations that limit the data density achievable with such disks.

To provide substantially improved data densities, Applicants provided an optical disk in which the data-carrying layer is not covered by a relatively thick defocusing layer. Instead, as seen, for example, in Applicants' Figure 1, a data-carrying layer may be formed using a metal/alloy layer (element 14) overlaying the substrate (element 12). Claim 1 reflects these features in that it recites "a substrate having oppositely facing first and second surfaces" and a "first metal/alloy layer overlaying the first surface of the substrate, wherein the first metal/alloy layer comprises tin, antinomy, and an element selected from the group consisting of indium, germanium, aluminum, and zinc." Support in the specification for the claimed substrate may be seen, for example, on page 11, lines 5-15. Support for the claimed metal/alloy layer may be seen, for example, on page 7, lines 6-12.

As seen in Figure 1, a silicon oxynitride layer (element 16) overlays the metal/alloy layer to enhance an optical contrast between an amorphous state and

a crystalline state for the metal/alloy layer. As discussed with regard to Figures 6A and 6B, the thickness and index of refraction of the silicon oxynitride layer may be selected so as to enhance an optical contrast between an amorphous and a crystalline state of the metal/alloy layer. Thus, claim 1 also recites a "first silicon oxynitride layer overlaying the first metal/alloy layer, wherein a thickness of the first silicon oxynitride layer and an index of refraction of the first silicon oxynitride layer are selected to enhance an optical contrast between an amorphous state of the first metal/alloy layer and a crystalline state of the first metal/alloy layer..." Support for such a limitation is seen, for example, on page 12, line 7 through page 14, line 16.

As seen in Figure 1, no further layers overlay the silicon oxynitride layer. Thus, claim 1 limits the first silicon oxynitride layer such that "no further layers overlay the first silicon oxynitride layer. Support for such a limitation is given in the specification, for example, on page 10, lines 10-13 in which the Applicants note that the light beam "first passes through the dielectric layer [the silicon oxynitride layer]." The light beam cannot first pass through the dielectric layer if there were overlaying layers on this layer.

Support for independent claim 13 is analogous to that discussed above for claim 1. Specifically, claim 13 recites the act of "forming a first metal/alloy layer overlaying a first surface of a substrate wherein the first metal/alloy layer comprises tin, antinomy, and an element selected from the group consisting of indium, germanium, aluminum, and zinc," which is supported in the specification on, for example, page 7, lines 6-12. In addition, claim 13 recites the act of "forming a first silicon oxynitride layer overlaying the first metal/alloy layer, wherein the first silicon oxynitride layer has a thickness and an index of refraction selected to enhance an optical contrast between an amorphous state of the first metal/alloy layer and a crystalline state of the first metal/alloy layer, and wherein the first metal/alloy layer is positioned between the first silicon oxynitride layer and no further layers overlay the first silicon oxynitride layer." Support for this act

is given by, for example, page 12, line 7 through page 14, line 16 and page 10, lines 10-13.

Grounds for Rejection to be Reviewed on Appeal

1. Whether, under 35 U.S.C. § 103(a), claims 1, 3-13 and 15-20 are unpatentable over U.S. Patent No. 4,960,680 (Pan et al.) in view of EP 0945860 A (MATSUSHITA ELECTRIC INDUSTRIAL CO LTD), JP 03-086943 A (ASAHI CHEM IND CO LTD), U.S. Patent No. 5,783,360 (Phillips et al.), U.S. Patent No. 6,503,690 (Uno et al.), U.S. Patent No. 5,876,822 (Zhou et al.) and U.S. Patent No. 5,498,507 (Handa et al.).

2. Whether, under 35 U.S.C. § 103(a), claims 1, 3-6, 8-13, 15-17 and 19-20 are unpatentable over either of U.S. Patent No. 4,774,170 A (Pan et al.), U.S. Patent No. 4,812,386 A (Pan et al), or U.S. Patent No. 4,798,785 (Pan et al.) in view of EP 0945860 A (MATSUSHITA ELECTRIC INDUSTRIAL CO LTD), JP 03-086943 A (ASAHI CHEM IND CO LTD), Phillips et al. '360, Uno et al., '690, Zhou et al. '822 and Handa et al. '507.

3. Whether, under 35 U.S.C. § 103(a), claims 1-20 are unpatentable over either of U.S. Patent No. 4,960,680 (Pan et al.), U.S. Patent No. 4,774,170 A (Pan et al.), U.S. Patent No. 4,812,386 A (Pan et al), or U.S. Patent No. 4,798,785 (Pan et al.) in view of EP 0945860 A (MATSUSHITA ELECTRIC INDUSTRIAL CO LTD), JP 03-086943 A (ASAHI CHEM IND CO LTD), Phillips et al. '360, Uno et al., '690, Zhou et al. '822 and Handa et al. '507, and further in view of U.S. Patent No. 5,972,459 A (Kawakubo et al.).

Argument

1. No prima facie case of obviousness has been established with regard to the rejection of claims 1, 3-13 and 15-20 as being unpatentable over U.S. Patent No. 4,960,680 (Pan et al.) in view of EP 0945860 A (MATSUSHITA ELECTRIC INDUSTRIAL CO LTD), JP 03-086943 A (ASAHI CHEM IND CO LTD), U.S. Patent No. 5,783,360 (Phillips et al.), U.S. Patent No. 6,503,690 (Uno et al.), U.S. Patent No. 5,876,822 (Zhou et al.) and U.S. Patent No. 5,498,507 (Handa et al.).

Note that claim 1 is directed to a "first surface" disk in which no layers overlay the first silicon oxnitride layer as required by the limitation of "no further layers overlay the first silicon oxynitride layer." In addition, claim 1 requires the first silicon oxynitride layer "wherein a thickness of the first silicon oxynitride layer and an index of refraction of the first silicon oxynitride layer are selected to enhance an optical contrast between an amorphous state of the first metal/alloy layer and a crystalline state of the first metal/alloy layer." As will be seen by the following discussion, the cited prior art is silent regarding both these limitations. Moreover, Applicants are baffled by the Examiner's position on page 5, top paragraph (emphasis in the original in bold that the "optimization of both the refractive index and the thickness to maximize contrast seems to yield particularly advantageous results. The applicant may wish to include these limitations in the claims." This is a statement repeated by the Examiner from October 17, 2005 final office action (see the bolded comments on page 5) and in the May 1, 2005 non-final office action (see the bolded comments on page 5). Applicants completely agree that such an optimization is particularly advantageous and is recited in claim 1. Yet the prosecution of this case is extended over and over.

For example, consider the Pan '680 reference: the Applicants readily admit that the Pan series of patents are well-known in the optical disk fields as being directed to advances in the phase-change layer (what Applicants denoted

as the metal/alloy layer). However, Pan is completely silent regarding a metal/alloy layer being covered by a silicon oxynitride layer having the properties recited in claim 1.

EP 0945860 A, discloses crystallization accelerating layers adjacent to a recording layer to provide effective erasure at high speed during rewriting. Contrary to Examiner's assertion, EP 0945860 A is silent on the relationship or importance of the thickness of a silicon oxynitride layers for enhancing the optical contrast between the crystalline and amorphous states of the data storage layer. Furthermore, the cited reference shows, in all examples, light illuminating the optical disk from the substrate side (see, for example, Figures 1 and 2), which has been shown clearly not the case in Applicants' Summary of Claimed Subject Matter.

JP 03-086943 A discloses an optical disk structure having, in order, a substrate, interference (which, Applicants suspect, may be preferably translated as "interface") layer, recording layer, and protective layer. No optical interference properties, or thickness dependencies therein, are ascribed to the "interference layer". Guide grooves are provided on the substrate side, indicating that laser light illumination is from this side, and not through the protective layer. Furthermore, the cited reference is silent on the relationship or importance of the thickness of a silicon oxynitride layer for enhancing the optical contrast between the crystalline and amorphous states of the data storage layer, where, in any case, the protective layer performs no optical function as recited in claims 1 and 13.

Phillips '360 discloses a layered optical disk structure comprising, in order, a substrate, metal/alloy film layer, and a protective layer. The disk is a conventional CD wherein data is write-once stored by pitting the metal film layer using a "pyroplastic deformation technique to create data pits in the media", i.e., not by crystallizing the data storage layer. Reading the data is benefited by a protective film of SiO2 (not silicon oxynitride) of thickness to control reflectivity

from the pitted layer of metal/alloy. Yet, the cited reference is silent on the relationship or importance of a thickness of the silicon oxynitride layer for enhancing the optical contrast between the crystalline and amorphous states of the data storage layer.

Uno '690 discloses a layered optical disk structure comprising, in order, a substrate, protection layer (which may comprise silicon oxynitride) and recording medium, and additional layers disposed above the recording medium, in contrast to Applicant's structure, wherein "no further layers overlay the first silicon oxynitride layer". The cited reference is silent on the relationship or importance of the thickness of a silicon oxynitride layer for enhancing the optical contrast between the crystalline and amorphous states of the data storage layer, specifically when illuminated optically from a side of the optical disk having the silicon oxynitride layer, wherein "no further layers overlay the first silicon oxynitride layer". Applicants point this out, since the contrast depends at least on the relative refractive indices of the materials adjoining both sides of Uno's protective layer, in contrast to Applicants' silicon oxynitride layer, wherein "no further layers overlay the first silicon oxynitride layer".

Zhou '822 discloses a layered optical disk structure comprising, in order, a substrate, protection layer, recording layer, a second protection layer, and a metal mirror layer, wherein the optical disk's recording layer is illuminated through the substrate, and in further contrast to Applicants' structure, wherein "no further layers overlay the first silicon oxynitride layer". Thus, the contrast optimization briefly mentioned by Zhou with respect to the first protective layer must account for both the recording media substrate refractive index and the recording media, but is silent on the relationship or importance of the thickness of a silicon oxynitride layer for enhancing the optical contrast between the crystalline and amorphous states of the data storage layer.

Handa '507 discloses a layered optical disk structure comprising, in order, at least a substrate, a first dielectric layer, recording layer, a second dielectric

layer, a reflective layer and a protective layer, wherein the optical disk's recording layer is illuminated through the substrate layer, in contrast to Applicants' invention, and further in contrast to Applicants' structure, wherein "no further layers overlay the first silicon oxynitride layer". Thus, the contrast optimization briefly mentioned by Handa with respect to the first protective layer must account for both the substrate refractive index and the recording media refractive index, but is silent on the relationship or importance of the thickness of a silicon oxynitride layer for enhancing the optical contrast between the crystalline and amorphous states of the data storage layer wherein "no further layers overlay the first silicon oxynitride layer".

Because the cited prior art discussed above has made no teaching or suggestion for the limitation of "first silicon oxynitride layer overlaying the first metal/alloy layer, wherein a thickness of the first silicon oxynitride layer and an index of refraction of the first silicon oxynitride layer are selected to enhance an optical contrast between an amorphous state of the first metal/alloy layer and a crystalline state of the first metal/alloy layer, and wherein no further layers overlay the first silicon oxynitride layer," claim 1 and its dependent claims 2-12 are allowable over these references.

Claims 13 and 15-20 are allowable for analogous reasons in that there is no suggestion or teaching in these references for the element of "forming a first silicon oxynitride layer overlaying the first metal/alloy layer, wherein the first silicon oxynitride layer has a thickness and an index of refraction selected to enhance an optical contrast between an amorphous state of the first metal/alloy layer and a crystalline state of the first metal/alloy layer, and wherein the first metal/alloy layer is positioned between the first silicon oxynitride layer and no further layers overlay the first silicon oxynitride layer" as recited in independent claim 13.

2. No prima facie case of obviousness has been established with regard to the rejection of Claims 1, 3-6, 8-13, 15-17 and 19-20 as being unpatentable over either of U.S. Patent No. 4,774,170 A (Pan et al.), U.S. Patent No. 4,812,386 A (Pan et al), or U.S. Patent No. 4,798,785 (Pan et al.) in view of EP 0945860 A (MATSUSHITA ELECTRIC INDUSTRIAL CO LTD), JP 03-086943 A (ASAHI CHEM IND CO LTD), Phillips et al. '360, Uno et al., '690, Zhou et al. '822 and Handa et al. '507.

The teachings of Pan '170, Pan '386, and Pan '785 are cumulative to Pan '680, adding nothing to Pan '680 with respect to Applicants' invention. Thus, claim 1 and its dependent claims 3-6 and 8-12 and also claim 13 and its dependent claims 15-17 and 19-20 are patentable over the combination of these references as discussed above.

3. No prima facie case of obviousness has been established with regard to the rejection of claims 1-20 as being unpatentable over either of U.S. Patent No. 4,960,680 (Pan et al.), U.S. Patent No. 4,774,170 A (Pan et al.), U.S. Patent No. 4,812,386 A (Pan et al), or U.S. Patent No. 4,798,785 (Pan et al.) in view of EP 0945860 A (MATSUSHITA ELECTRIC INDUSTRIAL CO LTD), JP 03-086943 A (ASAHI CHEM IND CO LTD), Phillips et al. '360, Uno et al., '690, Zhou et al. '822 and Handa et al. '507, and further in view of U.S. Patent No. 5,972,459 A (Kawakubo et al.).

Kawakubo '459 discloses a layered optical disk structure comprising, in order, a substrate, a reflective film, a phase-change recording layer, and a light transmissive layer which may be construed as a protective layer. Once again, the cited reference <u>is silent on the relationship or importance of the thickness of a silicon oxynitride layer for enhancing the optical contrast between the crystalline and amorphous states of the data storage layer</u>. Rather, Kawakubo's transmissive layer thickness determination is influenced by the numerical aperture (N.A.) of the optical reader system so as to minimize various aberrations.

The Examiner has noted as discussed above that "**the optimization of both the refractive index and the thickness to maximize contrast seems to yield particularly advantageous results. The applicant may wish to include these limitations in the claims.** [Examiner's emphasis]"

Applicants teach that achievable control of the index of refraction of deposited silicon oxynitride during fabrication is superior to SiO_2, which is a critical aspect of optimizing the top layer to reliably enhance optical contrast. The Examiner appears not to be concerned or cognizant of what Applicants disclose that is the basis of the claims – that optimization of enhanced optical contrast in an optical data storage device depends on selection of materials (i.e., silicon oxynitride, as in claim 1), and method of making (i.e., forming a layer of silicon oxynitride having a refractive index and thickness to enhance contrast), as in claim 13). Support is provided in the specification at least on page 9, most particularly lines 15-28. It is noted that "optical path length is the product of refractive index and physical thickness", so that contrast enhancement takes both properties (i.e., index and thickness) into account <u>explicitly</u>. Refractive index selection was already incorporated in the limitation of claims 1 and 13 at the time of the Examiner's suggestion. Regarding thickness, Applicants have amended as helpfully suggested by the Examiner (and gratefully acknowledged the Examiner's thoughtful suggestion). Despite Applicants' compliance, as recommended by the Examiner, the Examiner made the same suggestion a second time, in the final Office Action dated November 8, 2006. Applicants remain puzzled as to why the claims were again rejected over the prior art without proper justification, i.e., taking the suggested amendments into account.

Applicants therefore respectfully submit that the cited references do not singly or in combination render claims 1 and 13 obvious, and are therefore patentable over the totality of ten cited references. Accordingly, claims 1 and 13, and their dependent claims 2-12 and 14-20 are patentable over the cited prior art.

Therefore, in light of the foregoing arguments, Applicants respectfully request the Honorable Board of Appeals to reverse the decision of the Examiner with respect to claims 1 through 20.

Respectfully submitted,

Date: Sept. 10, 2007 By: [signature]

Jonathan W. Hallman
Reg. No. 42,622

Claims Appendix

1. An optical data storage device comprising:

a substrate having oppositely facing first and second surfaces;

a first metal/alloy layer overlaying the first surface of the substrate, wherein the first metal/alloy layer comprises tin, antimony and an element selected from the group consisting of indium, germanium, aluminum, and zinc, and;

a first silicon oxynitride layer overlaying the first metal/alloy layer, wherein a thickness of the first silicon oxynitride layer and an index of refraction of the first silicon oxynitride layer are selected to enhance an optical contrast between an amorphous state of the first metal/alloy layer and a crystalline state of the first metal/alloy layer, and wherein no further layers overlay the first silicon oxynitride layer.

2. The optical data storage device of claim 1 further comprising:

a second metal/alloy layer overlaying the second surface of the substrate, wherein the second metal/alloy layer comprises tin, antimony and an element selected from the group consisting of indium, germanium, aluminum, and zinc, and;

a second silicon oxynitride layer overlaying the second metal/alloy layer, wherein the second metal/alloy layer is positioned between the substrate and the second silicon oxynitride layer.

3. The optical data storage device of claim 1 wherein the first metal/alloy layer has a cross-sectional thickness between 40nm and 125nm.

4. The optical data storage device of claim 1 wherein the first silicon oxynitride layer has a cross-sectional thickness between 20nm and 120nm.

5. The optical data storage device of claim 1 wherein the first silicon oxynitride layer has a cross-sectional thickness of approximately 60nm and the first metal/alloy layer has a cross-sectional thickness of approximately 85nm.

6. The optical data storage device of claim 1 wherein the substrate comprises a rigid material.

7. The optical data storage device of claim 1 wherein the metal/alloy layer comprises $Sb_{70}Sn_{15}In_{15}$.

8. The optical data storage device of claim 1 wherein the first metal/alloy layer is formed using a sputtering technique.

9. The optical data storage device of claim 1 wherein the first metal/alloy layer is formed using a vapor deposition technique.

10. The optical data storage device of claim 1 wherein a real part of refractive index for the first silicon oxynitride layer is between 1.4 and 2.0.

11. The optical data storage device of claim 1 wherein the first surface of the substrate is grooved, wherein grooves of the first surface define raised surface portions, recessed surface portions, and side walls therebetween.

12. The optical data storage device of claim 1 wherein the first metal/alloy layer comprises a grooved surface, wherein grooves of the first metal/alloy layer define raised surface portions, recessed surface portions, and side walls therebetween, wherein the raised surface portions are configured to store optical data.

13. A method comprising:

forming a first metal/alloy layer overlaying a first surface of a substrate wherein the first metal/alloy layer comprises tin, antimony and an element

selected from the group consisting of indium, germanium, aluminum, and zinc, and;

forming a first silicon oxynitride layer overlaying the first metal/alloy layer, wherein the first silicon oxynitride layer has a thickness and an index of refraction selected to enhance an optical contrast between an amorphous state of the first metal/alloy layer and a crystalline state of the first metal/alloy layer, and wherein the first metal/alloy layer is positioned between the substrate and the first silicon oxynitride layer_and no further layers overlay the first silicon oxynitride layer.

14. The method of claim 13 further comprising:

forming a second metal/alloy layer overlaying a second surface of the substrate, wherein the second metal/alloy layer comprises tin, antimony and an element selected from the group consisting of indium, germanium, aluminum, and zinc, and;

forming a second silicon oxynitride layer overlaying the second metal/alloy layer, wherein the second metal/alloy layer is positioned between the substrate and the second silicon oxynitride layer.

15. The method of claim 13 wherein the first metal/alloy layer has a cross-sectional thickness between 40nm and 125nm.

16. The method of claim 13 wherein the first dielectric layer has a cross-sectional thickness between 20nm and 120nm.

17. The method of claim 13 wherein the substrate comprises a rigid material.

18. The method of claim 13 wherein the metal/alloy layer comprises $Sb_{70}Sn_{15}In_{15}$.

19. The method of claim 13 wherein the first metal/alloy layer is formed using a sputtering technique.

20. The method of claim 13 wherein a real part of refractive index for the first dielectric layer is between 1.4 and 2.0.

Evidence Appendix

No evidence was submitted under 37 CFR 1.130, 1.131, or 1.132.

Related Proceedings Appendix

There are no related proceedings.